

JUN 10 2002

AMENDMENT TRANSMITTAL LETTER

Docket No.
47753.C2

LNC form

Application No.
09/609,513

Filing Date
07/03/2000

Examiner
M. Alvo

Group Art Unit
1731

Invention Title
MINIMIZING CHLORINATED ORGANICS IN PULP BLEACHING PROCESSES

TO THE ASSISTANT COMMISSIONER FOR PATENTS

Transmitted herewith is an amendment in the above-identified application.

- ☐ Small Entity status of this application has been established under 37 CFR 1.27 by a verified statement previously submitted.
- ☐ A verified statement to establish Small Entity status under 37 CFR 1.27 is enclosed.
- ☒ No additional fee is required.
- ☐ The fee has been calculated as shown below:

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TC 1700

CLAIMS AS AMENDED

	(1)	(2)	(3)			
	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT NUMBER EXTRA	RATE	FEE
TOTAL CLAIMS	* 40	minus	** 48	0	x \$18	\$ 0
INDEPENDENT CLAIMS	* 4	minus	*** 4	0	x \$80	0
MULT. DEPENDENT CLAIM ADDED					\$270	0
					TOTAL	\$ 0
If applicant has small entity status under 37 CFR 1.9 and 1.27, then divide total fee by 2, and enter amount here.				SMALL ENTITY TOTAL		\$ 0

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
 ** If the highest number previously paid for IN THIS SPACE is less than 20, enter "20".
 *** If the highest number previously paid for IN THIS SPACE is less than 3, enter "3".
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- ☐ A check in the amount of \$ to cover the filing fee is enclosed.
- ☒ The Commissioner is hereby authorized to charge payment of the following fees associated with this communication or credit any overpayment to Deposit Account No. 12-2355. **A duplicate copy of this sheet is enclosed.**
- ☒ Any additional filing fees required under 37 CFR 1.16.
- ☒ Any patent application processing fees under 37 CFR 1.17.

Date: June 3, 2002

Mark S. Graham
Mark S. Graham, Reg. No. 32,355

Form LNC (9/96)

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on June 3, 2002
Date

Mark S. Graham
Mark S. Graham



#9/BM
6-21-02
Attorney Docket No. 47753.C2/ C-3520.0

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Ted TSAI
Application No.: 09/609,513
Filing Date: July 3, 2000
Confirmation No.: 1686
Title: MINIMIZING CHLORINATED ORGANICS
IN PULP BLEACHING PROCESSES
Examiner: M. Alvo
Group Art Unit: 1731

AFTER FINAL RESPONSE

BOX AF
Assistant Commissioner for Patents
Washington, D.C. 20231

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Sir:

REMARKS

This is in response to the Office Action of March 1, 2002, in which Claims 1 - 7, 10, 11, 13 - 17, 19 - 26, 29 - 37, 39 - 42, and 44 - 48 (all of pending claims) were finally rejected under Section 103 as allegedly being obvious over the prior art. Applicant respectfully traverses all grounds for rejection and requests reconsideration and favorable action in light of the following remarks.

I. The Inventor's Declaration Is Sufficient to Remove the Devenyns and WO 95/27100 References As Prior Art.

Under 37 C.F.R. 1.131, a cited reference may be removed as prior art if the Applicant establishes invention of the claimed subject matter prior to the effective date of the reference. This may be accomplished by submission of an inventor's declaration showing reduction to practice of the invention prior to the effective date of the reference. In this instance, the declaration of the inventor, Dr. Ted Tsai, clearly demonstrates reduction to practice of his invention before the effective date of either Devenyns or the WO 95/27100

reference.

The Devenyns article was apparently published in connection with a 1995 TAPPI Pulping Conference and is hand- marked as being published in October of 1995. The WO 95/27100 application has an international publication date of October 12, 1995. Thus, both references may be removed by demonstration of reduction to practice of the claimed invention prior to October 1, 1995.

The subject matter claimed in the independent claims of the application currently reads as follows:

Claim 1. A method for bleaching a digested kraft pulp containing lignocellulosic fibers with one or more chlorine containing compounds which comprises treating the pulp at a pH within the range of from about 1 to about 6 with a chelating agent during a second chlorine dioxide bleach stage following a first chlorine dioxide-containing bleach stage and, thereafter, as the next and final bleaching stage after the second chlorine dioxide bleach stage, treating the pulp with a peroxide bleach agent, whereby the peroxide-treated pulp exhibits a substantial improvement in viscosity retention and brightness over the same pulp in the absence of treatment with the chelating agent during the second chlorine dioxide bleach stage.

Claim 19. A process for bleaching a pulp containing lignocellulosic fibers comprising:

bleaching the pulp with a chlorine-containing compound in an initial bleaching stage;

treating the pulp in an extraction stage following the initial bleaching stage wherein the extraction stage contains oxygen and/or peroxide;

thereafter treating the pulp during a chlorine dioxide bleaching stage or during an optional wash carried out immediately after the chlorine dioxide bleaching stage, at a pH within the range of from about 1 to about 6, with from about 0.01 wt.% to about 1 wt. % chelating agent, based on the dry weight of fibers in the pulp, for a period of time sufficient to substantially improve the brightness of the pulp; and

treating the pulp with a peroxide bleach agent in a final bleaching stage subsequent to the chlorine dioxide bleaching stage.

Claim 36. A process for bleaching a digested kraft pulp containing lignocellulosic fibers with chlorine and non-chlorine-containing bleaching agents, wherein the pulp has a consistency in the range of from about 0.5% to about 40% , the process comprising:

bleaching the pulp with chlorine dioxide in a first bleach stage;

treating the pulp in an extraction stage following the first bleach stage wherein the extraction stage contains oxygen and/or peroxide;

treating the pulp during a second chlorine dioxide bleach stage following the

extraction stage with a metal chelating agent at a pulp pH ranging from about 1 to about 6, wherein the amount of chelating agent is sufficient to substantially reduce an organic halide content of the bleached pulp and wherein the temperature of the pulp during the treating is within the range of from about 35° to about 110°C; and

bleaching the pulp with a peroxide bleach agent in a bleach stage after the second chlorine dioxide bleach stage without any intermediate treatment between the peroxide stage and the second chlorine dioxide stage other than an optional wash.

Claim 46. A process for bleaching kraft-digested pulp which comprises a sequence of bleach stages selected from the group consisting of $D_0E_{O+P}D_1P$, $D_0E_PD_1P$ and $D_0/C E_PD_1P$ with an optional washing step between the D_1 and P stages of each wherein a chelating agent is added during the D_1 stage and/or during the optional wash between the D_1 and P stages in an amount and under conditions which are sufficient to produce a bleached pulp having substantially improved brightness, viscosity and yield as compared to pulp bleached using the same sequences without the chelating agent addition.

Thus, each of the claims relates to a DEDP bleaching sequence wherein a chelating agent (Q) is added in at least the second D stage and wherein the extraction stage (E) may be reinforced with peroxide and / or oxygen. The Record of Invention (ROI) attached to Dr. Tsai's declaration clearly shows reduction to practice of this basic technology, and as the declaration attests the ROI was completed and submitted to the assignee well before October 1, 1995. The experiments described therein were conducted earlier still.

Turning now to specific portions of the ROI, at page 2 in his "Technical Findings", Dr. Tsai determined that chelating agents (CA) may both boost pulp brightness and prevent viscosity loss, especially in bleaching sequences wherein a peroxide (P) stage follows a chlorine dioxide stage. In Technical Finding 6, Dr. Tsai determined that addition of the chelating agent in the D_1 stage¹ was preferred and more efficient than chelating agent addition in other stages.

Table 1 of the ROI summarizes the results of a group of experiments wherein a chelating agent was added to the "D" or "D1" stage of a $D_0E_{O+P}DP$ bleaching sequence. These experiments show improvement in both final pulp brightness and viscosity compared to a control sample wherein no chelating agent was added. For example, in the control (Sample No. 1), the final brightness was 86.3 and the final viscosity was 15.7 cP. However,

¹In his experimental notes, Dr. Tsai refers to an initial chlorine dioxide stage as a " D_0 " stage. The second chlorine dioxide stage then becomes a " $D1$ " stage and so forth.

when 0.4 EDTA chelating agent was added in Sample No. 2, brightness improved to 88.7 and viscosity improved 24.2 percent to 19.5 cP.

In Table 2, further experiments are documented showing the improved performance of a D_oE_{o+p} DP bleaching sequence when a chelating agent is added to the D stage. Again, in comparing Samples 11 (control) and 12, a dramatic improvement in viscosity is seen. Likewise, Table 4 shows still further examples of reduction to practice of the claimed subject matter.

While the use of peroxide in pulp bleaching is known, it is also a well-documented drawback of peroxide that it adversely affects pulp strength (more so in many instances than other agents). This believed to be due to peroxide's reduced selectivity and concomitant greater tendency to attack on the desirable cellulose constituent of pulp during the bleaching process. And while peroxide offers promise as a terminal stage of a bleach sequence (due to its bleaching effect on prior-bleached pulp), the aggressive nature of peroxide's attack on the cellulose itself is even more pronounced when the pulp has already been rid of much of its lignin content. The present invention addresses these problem enabling use of peroxide near the end of a bleach sequence without the dramatic loss in viscosity that would normally be expected when peroxide is applied to already-bleached pulp.

In view of these results in the ROI, there can be no doubt that Dr. Tsai reduced his invention to practice prior to October 1, 1995. Moreover, all of Dr. Tsai's work was completed in the U.S. at the research center of the assignee in New York. The ROI is clearly addressed as originating from Tuxedo, New York. Hence, the claimed invention was reduced to practice in the United States prior to the effective dates of the Devenyns and WO 95/27100 references, and the references should therefore be removed as prior art.

II. The Surprising Bleaching Results Obtained by the Claimed Bleaching Process Overcome Any Possible Prime Facie Case of Obviousness.

As the Applicant has stressed previously, the claimed invention is not prima facie obvious in view of the cited art combination because there is no motivation to combine the art in the manner proposed by the Examiner. And even if the art was combined, the combination would still fail to provide all the limitations of the claimed invention.

Applicant's explanation of these issues is stated in his Response of October 17, 2001. In brief, of the references remaining after removal of the Devenyns and WO 95/27100 references, the European '491 application shows only a D_QP sequence. The application fails to suggest strategic use of a chelating agent in a later D stage of a DEDP sequence as claimed, and that such a measure would produce the advantages shown to result from Applicant's invention. While the Examiner cites a string of other references for the supposed equivalence of a D stage and a DED sequence, there is no motivation to combine the cited references with the '491 application to arrive at a $D_oE_{o+p}DP$ sequence as claimed with strategic use of a chelating agent in the later D stage for the demonstrated advantages. Thus, the claimed invention is not prima facie obvious in view of the cited art.

Even if a prima facie case of obviousness had been made by the Examiner, and again it has not, Applicant's experiments show surprising and unexpected improvements over the prior art which more than offset any alleged prima facie obviousness. Numerous examples throughout the specification show surprising improvements in pulp brightness and / or viscosity as compared to a hypothetical DEDP bleaching sequence without the addition of any chelating agent. The following examples are illustrative of the improvements seen:

In Samples 1 and 2 (Table 1), two $D_oE_{o+p}DP$ bleaching sequences were compared, one with no chelating agent and one with a chelating agent in the D stage. The observed brightness increased 2.4 points and the viscosity increased 3.8 cP when a chelating agent was employed in the D stage. This is highly surprising and unexpected.

Similarly, in Table 7, Samples 46 and 47 show the dramatic improvement in the bleaching of a hardwood pulp when 0.5% EDTA chelating agent is added in the D stage of a $D_oE_{o+p}DP$ bleaching sequence. As compared to the control sample, brightness improved over 9 points and at the same time, the pulp viscosity improved from 9.2 cP to 13.1 cP. This is over a 42% increase in final pulp viscosity. No prior art cited by the Examiner even hints at such results, which are truly profound and unexpected given that they arise in conjunction with a terminal peroxide stage previously known to adversely affect pulp strength (i.e., reduced viscosity).

Further still, in Table 9, a comparison of Samples 57 and 59 show the dramatic improvement in pulp viscosity when a chelating agent is added to the D stage of a $D_oE_{o+p}DP$

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bleaching sequence. While only a slight increase in brightness was observed, pulp viscosity increased 43.5 percent from 16.8 cP to 24.1 cP.

Such dramatic improvements in final pulp properties show that the claimed invention is in no way obvious in view of the prior art. Thus, even if the invention were prima facie obvious, these results completely rebut and overcome any hint of obviousness.

In view of the foregoing, Applicant urges the Examiner to reconsider the application and find that the claims do in fact define patentable subject matter over the applied art, and to issue a notice of allowance at the earliest possible convenience.

In the event this response is not timely filed, Applicant hereby petitions for the appropriate extension of time and requests that the fee for the extension along with any other fees which may be due with respect to this paper be charged to our **Deposit Account No. 12-2355**.

Respectfully submitted,

LUEDEKA, NEELY & GRAHAM, P.C.

By:

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on June 3, 2002
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